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THE NEW WELLAND CANAL

While the difference in level between Lakes Erie and Ontario furnishes us with the beauties of Niagara and while it is the means of developing many thousands of horse-power for man's use, yet it has its disadvantages for navigation, only overcome by the construction of artificial waterways. With thoughts once more turned to peaceful arts, Canada has resumed her work of enlarging the Welland Canal, a task second in magnitude only to that of uniting the Atlantic and Pacific Oceans at Panama.

In all, three canals will have been built between Lakes Erie and Ontario, all more or less closely follow the same route. In 1824 the first ditch was commenced, and on completion in 1833 it afforded passage to vessels 150 feet long, the smallest of the 27 locks being 150 feet long, 26½ feet wide, and carrying 10¼ feet of water over the sills. This early canal sufficed until 1872, when construction work was commenced on the canal now used for inlake traffic. This canal is somewhat shorter, has fewer locks, and deviating from the old one above Thorold, enters Lake Ontario at the same point, Port Dalhousie. The locks in this canal are 25 in number and are 270 feet long by 45 feet wide, with 14 feet of water over the sills.

The canal now under construction is to be still shorter and instead of 25 locks will have but seven. The elimination of 18 locks and the rapidity with which the remaining ones can be filled will mean a saving of three hours in the time taken to traverse the canal. The valves and culverts in the walls of the locks will be of such large dimensions that less than eight minutes will suffice to get a vessel through each lock.

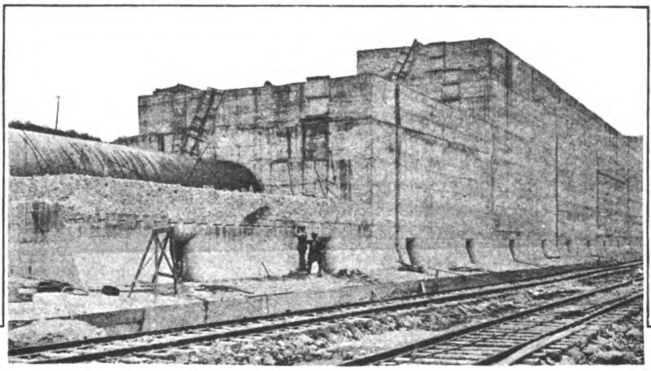
Each of the locks will be 42½ feet lift, 80 feet wide, and sufficiently long to accomodate a vessel of 800 feet. Thirty feet of water will be available through the locks and while the reaches for the time being will only be 25 feet deep they can readily be dredged out to 30 when required. The total length of the canal will be 25 miles and the aggregate difference in elevation to be overcome between its two termini is 325½ feet.

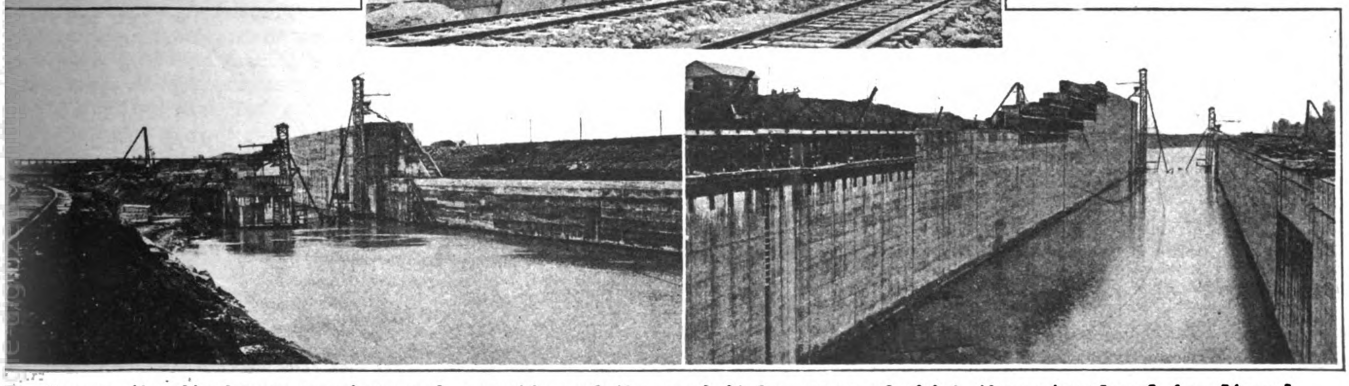
The lock walls will be 82 feet high above the top of gate sills, and including necessary foundation work two of the locks will have walls 100 feet high. Three of them will be built in flight and will be double. One of the flights will be used for vessels bound down-stream and the adjoining one for those up-bound, the double flight being required here to save long delays in the passage of vessels through the canal.

The lock gates will be of the swinging type, single leaf, with hinges at one side and resting in a notch in the opposite wall. The gate at the foot of each lock will be 83 feet high and will weigh in the neighborhood of 1100 tons.

A guard lock will be placed near the Lake Erie entrance to the canal, and just before lock seven is reached

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Above: the discharge openings and a portion of the conduit by means of which the water level is altered in locking vessels through the canal. Left: the canal prism in its present flooded condition, due to cessation of work during the war. Right: a general view of the concrete walls of the new canal locks.

VIEWS OF THE NEW WELLAND CANAL

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ETERNAL YOUTH AS A SCIENTIFIC THEORY

A DISCUSSION OF THE PLACE WHICH VORONOFF'S THESIS OCCUPIES IN THE GENERAL FIELD OF HUMAN INTEREST

By GENEVIEVE GRANDCOURT

In view of the alleged claim of Dr. Voronoff, of Paris, to have restored youth by the implantation of a young interstitial gland in the aged, it is instructive to recall the experiments of Brown-Sequard, who is responsible for modern organo-therapy. He also tried, by introducing under the skin emulsions prepared from the secretions of young animals, tp get the results stated by Voronoff. Although subsequent investigation upon these lines has not proved altogether barren, neither has it developed anything of sufficient note to mark anepoch.

Dr. G. F. Lydston of Chicago, writing last February in the Journal of the American Medical Association, gives several instances of gland implantation similar in technique to those recently attributed to Voronoff. These operations - upon men of varying ages, in varying degrees of physical, and especially of mental, deterioration - were performed by Dr Lydston some time agp, at least one of them as far back as four years. They are interesting from the scientific point of view in that they afford further and detailed experimental data regarding the relation that exists between senile decay, including its precocious manifestations, and disturbance of the reproductive function.

Whether Voronoff has, or has not, doneanything new in the same direction does not alter the fact that the general problem is much too complicated to regard it as solved by the throwing of light upon some particular angle of it. In fact, anything approaching a detailed technical discussion would be equally out of place and out of the question in these pages and this space. But the subject is one of such far-reaching importance that it seems worth while here to attempt to give it its general orientation, regardless of any definite value which Voronoff's work may turn out to possess or to lack.

THE NATURE OF THE PROBLEM

We have inherited the idea, that of all things death is the surest. Now what we see as living matter is distinguished from what we see as dead matter in not being, so to speak, "satisfied to remain as it is." The essence of being alive is to change, even when the change is not obviously beneficial. Illustrations are to be had, not only in physical growth, but in business, in politics, and in our social, intellectual and spiritual lives. The question is sometimes asked: "What is the good of so much progress, since it brings its own problems, and often makes us as individuals no happier." Yet obviously if we do not go ahead we must go back. Nothing that lives is the same today as it was yesterday.

Hence, logically, life should have no part with its antithesis, death; and modern science indicates that, fundamentally, perhaps it has not any part with it.

For example the first forms of life, the microscopic, one-celled organisms, the protozoa, do not die. When they are, as it were, ready for the next generation, the single cell divides with the result that there are two of a kind, equally old and equally young, where before there was but one. This is equivalent to entering upon a new stage of life without leaving behind any remains.

Whatever else such a change may be, it is admittedly not death. It is when the cells, multiplying to build tissue, incidentally evolve the many celled forms (metazoa) that death ensues. It would seem, therefore, that death must be the compensation exacted of life for complexity of structure; and the gist of the matter is to know whether, and to what extent, this applies.

POTENTIAL IMMORTALITY IN METAZOA?

Botanists tell us that trees have lived for thousands of years, then to succumb to earthquake or tempest alone. Witness the famous Dragon-Tree, in Teneriffe, uprotted by a storm; the Sequoia gigantea of California; the Mexican cypress; and the baobab of Cape Verde. By way of recalling the method employed to determine the age of the latter (estimated, by the way, as exceeding 5000 years) it might be mentioned that a French naturalist, after uncovering the first 300 layers of its wood, found an inscription dated 300 years earlier.

In contrast with this tenacity of trees is the trouble often experienced by gardeners, in keeping alive some of the lesser members of the vegetable kingdom. Yet by simple interference with their time of going to seed, certain annuals, notably the rye cultivated in the Cossack region of Russia, have been converted into biennials; while the biennial beet-root lives, under special conditions, more than double the period assigned to it.

If it be true that the very complex fruit-bearing properties of the annual plant involve the secretion of a poison, less harmful in its immediate effects upon the biennial, and still less so to the perennial, may we suppose that some analogous death dealing process has been dispensed with - overcome - in the potentially immortal great trees?

WHAT ABOUT THE ANIMAL KINGDOM?

All too short is the span of life allotted to our fireside friends, the dog and the cat. The sheep is practically in its extreme dotage at 14. Yet the age of certain reptiles is considered well-nigh incalculable, and two tortoises living at different periods in the palace of Canterbury are known to have survived captivity, respectively, by 128 and 107 years. A third, brought to the island of Mauritius in 1765, is still, apparently, very far indeed from old age.

Humboldt is often quoted as saying that a certain bird outlived an extinct tribe of savages. Whether his information was reliable or not, the eagle, eagle-owl, swan, vulture, raven, falcon, all own a lease of life so extended that it has passed into legend.

Man's longevity surpasses that of the other mammals; and he is rather inclined to believe the stories handed down that his race once attained an age out of proportion to anything like the present average. When the charlatan Cagliostro got credence of more or less weak-minded people for his tale of having lived a thousand years, he was playing on a tendency latent in us all to feel that life is too short, that it is unreasonable and (in view of the comparatively great ages attained by individuals here and there) perhaps even unnecessary that we should so often barely reach full usefulness when we are called upon to die.

Lejoncourt cites, among centenarians, a Norwegian of 146 who had been a sailor for 91 years; while we have all heard of Thomas Parr, dying at 153 after having worked hard until a score of years previously. His dead body was opened by Harvey, the discoverer of the circulation, and declared to be organically sound, with

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CORRECTING THE BALANCE OF REVOLVING PARTS

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In the illustration showing the machine removed from its casing, there is seen a vertical shaft in which is placed a tapered plug-spindle C; and on this is fitted a sleeve B which may be expanded by the screw A. On this sleeve B is mounted the pulley, flywheel or other member whose balance is to be tested. The tapered spindle C is held in place in the shaft by means of the nut D. The shaft carries two balance wheels E and F which are eccentrically weighted. These are movable with respect to each other by means of the gears G and H, and they may be turned until one exactly counterbalances the other, when an arrow on the wheel F will be in line with the word "balance" on the wheel E.

In use the part to be tested is mounted on the sleeve B and the balancing machine is revolved. Above the balance wheels the casing carries a stationary circular table, shown in our left and right hand views. On this may be seen an indicator dial, with a hand which remains at zero when the revolving parts are in balance. In the right hand view we have a flywheel under test on the spindle of the machine. When the machine is rotated, if the flywheel is unbalanced, it will produce vibrations that will cause the needle of the indicator to vibrate. By turning the hand wheels, the balancewheels E and F may be moved in either direction until they counterbalance the unbalanced weight in the piece under test. The indicator hand will obviously tell us which wheel to operate.

Testing proceeds until vibration ceases and the indicator hand therefore comes to rest at zero position. Then the machine is stopped and a reading is taken of the graduations on the two balance wheels which show through the opening in ourfirst view. As this is a flywheel which is under test, the balance must be restored by removing metal. Accordingly the flywheel is turned until an arrow on the upper balance wheel registers with the line shown at C. This will give a reading on the lower balance wheel F directly under the arrow. In order to determine just how much metal should be removed at any given place, there must be marked on the flywheel a chalk line in register with the line C. This is indicated at F in the third view. The radius plate A is adapted to slide in a radial slot in the table which carries the indicator. This plate carries a vertical shaft B and an indicator rod D bent at one end and terminating in a point E. The pulley under test is turned until the chalk mark F is in line with the indicator rod D. Then the radius plate is moved in or out until the point E is in line with the place on the flywheel from which it is desired to remove the metal. A reading is taken on the radius plate where it registers with the edge of the table and then by means of a chart which is supplied with the machine, together with the reading on the balance wheel F, there is shown just the number and depths of the holes necessary to remove the required amount of material at the place indicated by the pointer.

This balancing machine will take bodies from 4 to 36 inches in diameter, and will support weights as heavy as 600 pounds, revolving at 500 per minute. The speed range of the machine is from 250 to 900 revolutions per minute.

ETERNAL YOUTH AS A SCIENTIFIC THEORY

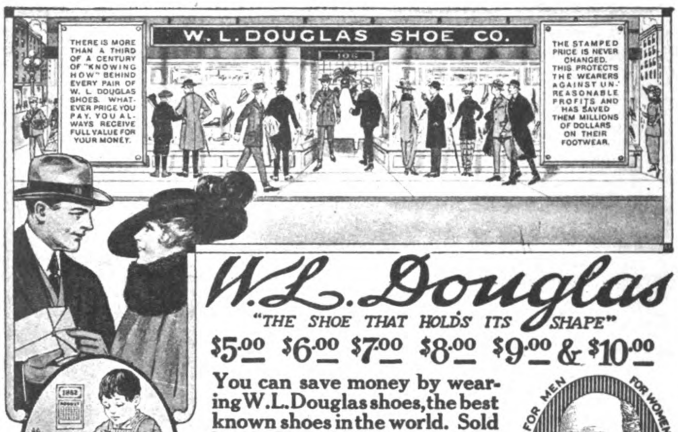
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the exception of the brain. Parr has his niche in Westminster Abbey.

On the other hand, Metchnikoff's description of a lady of 106 is to the effect that though feeble in a physic-

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ETERNAL YOUTH AS A SCIENTIFIC THEORY

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al sense, she had all her mental faculties and showed no sign of that supposedly invariable accompaniment to - if, indeed, not primary cause of - old age: i. e., hardening of the arteries.

What Really Causes Decay and Death?

Does anything really explain these astounding differences in the duration of existence? Why do certain species, as a whole, and why do individuals of other species, appear as exceptions to the rule that life is short?

The clue to the mystery is not to be found in the constitution of living matter. Under appropriate conditions the kidney and the liver will function after removal from the dead body. In an artificial circulation established "with warm, defibrinated blood,...the liver will secrete gall and produce urea, while the kidneys will resume the secretion of urine. ... The kidneys continue their synthetical activity by producing hippuric acid out of glycocoll and benzoic acid. These observations are of especial importance with regard to the fact that the synthetical action of the organ requires all the vital properties of the protoplasma of the cell." (Rational Organo-therapy; translated from the Russian of von Poehl, Tarchanoff, etc.)

Hence the "vital qualities" inherent in the physical basis of life may be made active after what we know as personal death. All this is in line with the above-mentioned fact that the primitive cell does not die. Yet if the unit, aggregations of which make up the animal body, is immortal - why should the aggregate be mortal? In other words, if we may put the matter in a somewhat melodramatic guise, can life multiplied by life equal death?

The answer is that though there is nothing in the protozoa, itself, to challenge its capacity to live endlessly, something may be introduced. The immortal may be reduced to mortality by poison, by extreme heat or extreme cold. Though not dying a natural death, the one-celled protozoa may die from secondary, external causes. Is it some such secondary cause, often if not indeed always preventable, which interferes sooner or later with the functioning of the many-celled metazoa?

Metchnikoff, in his Prolongation of Life, has expressed the opinion that "natural death" is exceedingly rare in nature. We have no further space to discuss further his reasons for coming to this conclusion. But obviously the experiments of Voronoff and others, looking toward the elimination of old age, would if successful constitute a long step toward the verification of the great Russian's guess.

THE NEW WELLAND CANAL

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guard gates will also be provided, both being safeguards against the sudden release of a flood of water through the carrying away of gates or other accident.

One of the interesting features of this work will be the alterations carried out where the present Canal crosses the Welland River by means of an aqueduct. This aqueduct will be done away with, the river level raised by a dam, and its channel used for the new canal for some distance. Any surplus water from the river will be allowed to flow over the dam and willrun off through the regular river channel, entering the Niagara River at Chippewa.

At Port Weller, so named in honor of John Laing Weller, the designer of the canal, much work will be necessary before it can properly be termed a harbor. Located some three miles east of Port Dalhousie, the present terminus

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